



GOVERNMENT OF NEPAL
Ministry of Federal Affairs and Local Development

Kathmandu Valley Post-Earthquake Debris Management

Strategic Plan



IOM International Organization for Migration

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EXECUTIVE SUMMARY

Disasters can generate sizable amount of waste depending on its severity and the waste thus generated can overwhelm existing solid waste management facilities and impact on other emergency response and recovery activities. Poorly managed disaster waste is threat to health, safety and the environment, and can be a major impediment to post-disaster rescue operations. Experience shows that disaster waste is often managed in an ad hoc manner; however, substantial improvements can be made in response efforts with a clear coordination structure and management plan.

Nepal is one of the most vulnerable countries in the world, in terms of natural disasters, and is highly susceptible to the seismic activities. Kathmandu valley is particularly prone to an earthquake's potentially devastating impact on both population and infrastructure. In the occurrence of an earthquake of a magnitude of 8 or more on the Richter scale, will leave an estimated 100,000 people dead, about 200,000 severely injured, 1.8 million displaced and 60-80 percent of buildings in the Kathmandu Valley could be destroyed or severely damaged resulting about 55 to 65 million tons of debris from this destruction.

The "Kathmandu Valley Post-Earthquake Debris Management Strategic Plan" is developed, with the financial support of the USAID/OFDA, to assist the Government of Nepal (GoN) in the preparedness efforts as enlisted in activities 8 and 9 of the National Disaster Response Framework (NDRF) as a key priority area for disaster management in the country, in coordination with the Ministry of the Federal Affairs and Local Development (MoFALD) and the Ministry of Home Affairs (MoHA). The plan is developed through the consultative process with the concerned stakeholder.

Nine of the of 83 gazette open spaces, with a total usable area of about **500,000 m²**, are allocated as sites for debris management. However, the space is insufficient for the management of debris and will require a total of 2,250 hectares of the land¹. Assuming that the debris management operations will be divided into four phases of six months each, the nine sites represents about 9 percent of the total space needed for debris management in the Kathmandu Valley. The need of identifying additional open spaces is crucial to manage debris during the emergency phase of the response in order to facilitate the rescue operations and provide access to critical roads and rescue sites. Also considering, the existing landfill site "Sisdole" is almost full and "Banchare Danda" is still under construction and is expected to take four to ten years for its completion.

1 Hectare (ha) = 10,000 Square Meters (m²).

It is estimated, the post-earthquake debris in the Valley will constitute considerable amounts of bricks, sand, aggregate, steel, timber, CGI sheet and Aluminum among others, which has economic value. The plan recommends for the involvement of private sector in managing the debris given its economic value and the solutions they could offer by taking innovative measures, improving efficiency and lowering costs as well as by providing additional ideas, technologies and skills or by creating livelihood opportunities. Heavy equipment entrepreneurs, contractors, transport entrepreneurs and reusable materials entrepreneurs will be the major stakeholders from the private sector. The NDRF has identified the Nepal Army as a responsible agency for immediate critical routes and debris clearance and Department of Roads for rubble clearance. However, involvement of other national and international stakeholder and relevant cluster such as Logistics will be equally important. Experience shows, local communities, if provided with appropriate trainings and equipment, play an important role in micro-level debris management which will reduce the amount of debris to be managed at macro level.

The MoFALD, in close coordination with the MoHA, will be a lead government agency for post disaster debris management in Nepal. Department of Roads and Department of Urban Development and Building Construction, as technical agencies, will be the technical advisors to the MoFALD for debris management.

It is believed, this plan will enable government agencies, humanitarian actors, private sector and local communities to plan, establish and coordinate responses to manage debris to provide immediate relief in the midst of an emergency and build back better. The plan is divided into 7 different parts with dedicated sections for various issues.

Purpose and Operational Objective

The purpose of this plan is to provide a general strategy to facilitate debris management in the Kathmandu Valley in a post-earthquake situation to prevent confusion in the coordination structure and roles among each stakeholder as well as to reduce the effects of the rubble impediment to recovery. The debris management plan also aims to assist the Government of Nepal in the preparedness efforts as enlisted in activities 8 and 9 of the National Disaster Response Framework (NDRF) as a key priority area for Disaster Management in the country. This strategy has been developed through a consultative process with the Government of Nepal and a broad range of stakeholders in order to increase the overall knowledge and understanding of the post-earthquake debris management problem in the Kathmandu Valley, raise awareness, stimulate discussion, as well as to ensure adequate preparedness for effective coordination of rubble removal and management during and after an emergency.

Earthquake Hazard Situation, Vulnerabilities and Impact Scenario in the Kathmandu Valley

Nepal is at high risk of natural disasters- particularly seismic activity, landslides and flooding. With a dense population and its location in a high-risk seismic zone², the Kathmandu Valley is particularly susceptible to an earthquake's potentially devastating impact on both population and infrastructure³. Moreover, the Kathmandu Valley is growing at a rate of four percent per year⁴, one of the fastest growing metropolitan areas in South Asia, and is one of the first regions in Nepal to face unprecedented challenges of rapid urbanization and modernization at a metropolitan scale. One critical challenge is haphazard and uncontrolled growth of built-up areas. Unplanned urban development and the very limited implementation of the Building Code in the Kathmandu Valley have also led to rapid and uncontrolled sprawl; irregular, substandard, and inaccessible housing development; and loss of open space. It has also increased vulnerability to disasters, making Kathmandu one of the most earthquake vulnerable cities in the world⁵.

In the event of a sizeable earthquake emergency in the region, estimates place the amount of rubble generated from infrastructure destruction to be the largest impediment to rescue, recovery and

² The Kathmandu Valley area is ranked 11th in the world as most at risk of a significant earthquake. Source: UNDP/BCPR (2004).

³ According to National Strategy for Disaster Risk Management in Nepal (2008), there have been 876 deaths, 6,840 injuries and over 55,000 buildings damaged in 22 earthquakes incidents in the last 3 decades in the country.

⁴ World Bank, "Managing Nepal's Urban Transition", <http://www.worldbank.org/en/news/feature/2013/04/01/managing-nepals-urbantransition>

⁵ Ibid.

reconstruction as well as one of the most challenging tasks confronting officials in charge of the response. In the occurrence of an earthquake of a magnitude of 8 to 10 on the Richter scale, an estimated 60-80 percent of buildings⁶ in the Kathmandu Valley could be destroyed or severely damaged⁷ and 55 to 65 million tons of debris may result from the total destruction⁸. This amount of debris is 330 times greater than the solid waste generated in the five municipalities of the Kathmandu Valley (KV) in a normal year⁹ and almost three times the debris generated in the aftermath of the Haiti earthquake of 2010¹⁰.

The manner in which the response is planned and organized may significantly affect the life-saving activities as well as the speed of the early-recovery and reconstruction process. Experience in other countries has shown that a gap usually exists during natural disaster responses in the availability of a plan to guide the authorities to address the problem of debris removal and management.

Estimates of Types and Volumes of Debris to Be Generated in the Event of Earthquake of Intensity VII-VIII-IX

Table 3. Types and Volumes of Debris to Be Generated in the Event of Earthquake of Intensity MMI VIII in Kathmandu Valley							
Locality Classification	Types and Volumes of Debris						
	Bricks (Million)	Sand (000 m3)	Aggregate (000 m3)	Steel (000 mt)	Timber (000 m3)	CGI Sheet (000 m2)	Others Al. D/W(000 m2)
City Core Area	1,231	222	445	74	451	1,562	40
Urban (Inner fringe)	1,302	596	1,195	197	228	573	110
Urban Sprawl (Outer Fringe Areas)	863	221	457	72	146	489	61
Rural Hinterland (Rural Areas)	958	7	15	2	453	1697	-
TOTAL	4,354	1,046	2,112	345	1,278	4,321	211

⁶ Approximately between 217,376 and 289,834 buildings. Source: Population Census 2011.

⁷ See Figure 2. Map of heavy building damage scenario in the Kathmandu Valley.

⁸ NSET, <http://www.nset.org.np>

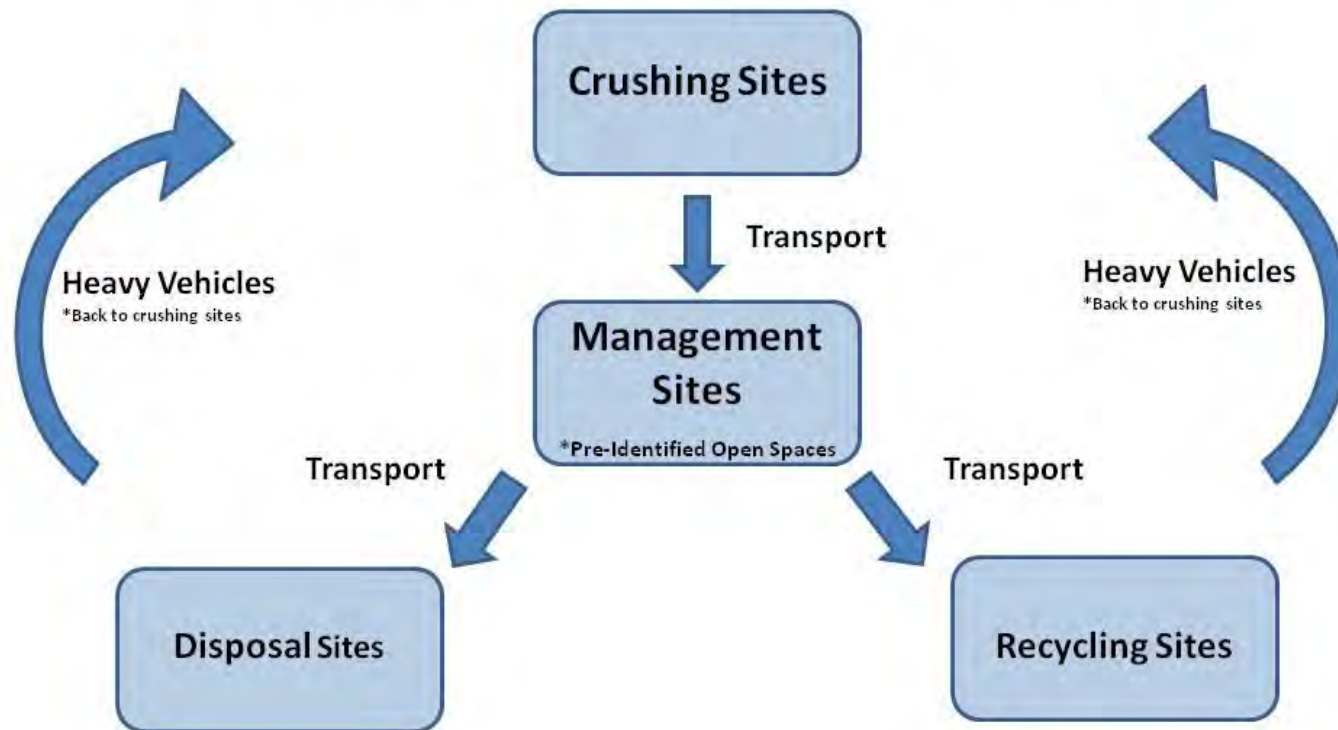
⁹ Around 700-1000mt of solid waste is generated in a day in the municipal areas of the KV. Source: Ministry of Urban Development, Solid Waste Management Technical Support Center, 2013.

¹⁰ Debris Management Plan for the Republic of Haiti by the US Army Corps of Engineers, Feb 2010, p. 7 -54.

Debris Composition

Based on the local construction practices and materials used, debris from the ruins of buildings destroyed/damaged by a major earthquake would consist mainly of brick, stone, concrete blocks, tile, cement concrete, steel bars, CGI sheets, wooden joist, beams, doors and window frames, steel pipes and tanks, UPVC pipes and tanks, electrical wires and cables, broken glass pieces, furniture and fixtures. Most of the metal parts, wood material, bricks and concrete blocks may be collected for reuse. Debris may also be mixed with dust, charcoal and ashes, grains, mud, clay, trees and plant remains and even dead bodies and animal carcasses. There may also be hazardous wastes such as gas cylinders, building material containing asbestos, hazardous pesticides, acids, batteries and chemicals from industries in the disaster-stricken areas that would require specific treatment and attention.

Step-By-Step Debris Management strategy



Critical Routes to Clear

The NDRF has identified the Department of Roads, under the Ministry of Physical Infrastructure and Transport, a key stakeholder in managing the roads clearance in collaboration with the Nepalese Army, which is responsible for immediate road clearance. Considering the sizable amount of debris to be cleared and managed in a sustainable way, the support of the private sector, national, regional and international efforts will be crucial. Coordination with the Logistics cluster is equally important in responding to the mega-earthquake disaster, especially during emergency phase. During the first part of the response, their operations will support the search and rescue and relief operations by facilitating access to sites, transport and emergency services. After the emergency phase, as the reconstruction phase begins, coordination with the Logistics cluster may diminish.

Open Spaces

A major earthquake in the Kathmandu Valley would result in critical humanitarian needs for an estimated 1.8 million displaced survivors in temporary settlements in and around the city. To address this potential risk, a recent joint Ministry of Home Affairs and IOM assessment identified 83 open spaces suitable for humanitarian purposes in the Kathmandu Valley. The final report which was drafted in coordination with concerned GoN ministries/agencies, security forces and humanitarian agencies has been endorsed by the Council of Ministers and has been published in the national gazette in order to prevent further urban encroachment of these sites. It is available online at <https://sites.google.com/site/kathmanduopenspaces/> for consultation and further use. The report contains detailed information about the possible usage of each site (IDPs camps, humanitarian coordination area, logistics hub, vulnerable settlement area, debris management, etc.), GIS data, general environmental assessment and topographical maps. Following the recommendations of the report, various clusters have begun the prepositioning of NFIs and the installation of deep tube wells in some of these sites.

While each site has a suggested use, as times and needs change, the allocation may also be modified. The MoHA is responsible for the maintenance of the 83 sites as well as for sharing information related to their use. It is important to note that the Open Spaces were never designed to provide a full response/reception capability for all displacement in the Kathmandu Valley following an earthquake. The Open Spaces are designed to provide the initial response planning framework for the Government of Nepal and partner agencies to be able to have a starting point from which to provide life-saving assistance to those in immediate need. This also applies for the nine sites identified for rubble management. These nine sites have been chosen to facilitate immediate rescue and early recovery operations with the objective to protect the overall natural and

socio-economic environment and the health and hygiene of the earthquake affected communities. With the completion of the operations, these sites will be re-instated and rehabilitated to pre-program conditions.

Table. The 9 Open Spaces Allocated for Debris Management

SN	Name	Area m ²	Suggested usages	Municipality/Ward	Site Characteristics
9	Bagmati Corridor 4	15,994.22	Multiple: Debris, dead body mgmt/morgue	Kathmandu, Ward 12	Bagmati River Bank
10	Bagmati Corridor 5	20,705.69	Multiple: Debris, dead body mgmt/morgue	Kathmandu, Ward 11	Bagmati River Bank
11	Bagmati Corridor 6	6,261.10	Debris collection	Kathmandu, Ward 34	Bagmati River Bank
47	Oxygenation Park	359,400.56	Debris collection	Lalitpur, Ward 4	Abandoned Sewage Treatment Area
60	Ringroad Balkumari Gwarko	78,169.03	Debris collection	Lalitpur, Ward 7, 8 & 9	Ringroad
62	Ringroad Gwarko Satdobato	71,129.10	Debris collection	Lalitpur, Ward 17 & 15	Ringroad
64	Ringroad Maharajgunj Chabahil	174,041.10	Debris collection	Kathmandu, Ward 4, 7 & 3	Ringroad
65	Ringroad Satdobato Ekantakuna	117,111.31	Debris collection	Lalitpur, Ward 13, 14 & 15	Ringroad
70	Shankha Park	10,751.35	Multiple: Debris collection, Logistics	Kathmandu, Ward 4	Public Park
	TOTAL	853,563.46	-	-	-

Considering that some of these sites have multiple suggested usages and considering the modification/limitations of some sites (eg. ringroad expansion), it is estimated that about 500,000 square meters are available for debris management in these nine sites. Assuming that the debris management operations will be divided into four phases of six months each, it is estimated the space available represents about 9 percent of the total space needed for debris management in the Kathmandu Valley following an earthquake of magnitude 8. The need of identifying additional open spaces is crucial to manage debris during the emergency phase of the response in order to facilitate the rescue operations and provide access to critical roads and rescue sites. In addition to complement the larger rubble clearing operation, a fleet of mini crushers can be stationed in different parts of the city.